# BYC20-600

## Rectifier diode, hyperfast

Rev. 01 — 28 November 2007 Product data sheet

# 1. Product profile

## 1.1 General description

Hyperfast, epitaxial rectifier diode in a SOD59 (2-lead TO-220AC) plastic package.

## 1.2 Features

- Extremely fast switching
- Reduces switching loss in associated MOSFET
- Low thermal resistance
- Low reverse recovery current

## 1.3 Applications

- Half-bridge or full-bridge switched-mode power supplies
- Half-bridge lighting ballasts
- Continuous Current Mode (CCM) Power Factor Correction (PFC)

## 1.4 Quick reference data

- $V_{RRM} \leq 600$ V
- $V_F = 1.54$ V (typ)
- $I_{F(AV)} \leq 20$ A
- $t_{rr} = 19$ ns (typ)

# 2. Pinning information

Table 1. Pinning

| Pin | Description | Simplified outline | Symbol |
|---|---|---|---|
| 1 | cathode (k) | SOD59 (2-lead TO-220AC) | k a 001aaa020 |
| 2 | anode (a) | | |
| mb | mounting base; cathode | | |

## 3. Ordering information

**Table 2. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BYC20-600 | TO-220AC | plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC | SOD59 |

## 4. Limiting values

**Table 3. Limiting values**
*In accordance with the Absolute Maximum Rating System (IEC 60134).*

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{RRM}$ | repetitive peak reverse voltage | | - | 600 | V |
| $V_{RWM}$ | crest working reverse voltage | | - | 600 | V |
| $V_R$ | reverse voltage | square waveform; $\delta = 1.0$; $T_{mb} \leq 100$ °C | - | 500 | V |
| $I_{F(AV)}$ | average forward current | square waveform; $\delta = 0.5$; $T_{mb} \leq 93$ °C | - | 20 | A |
| $I_{FRM}$ | repetitive peak forward current | square waveform; $\delta = 0.5$; $T_{mb} \leq 93$ °C; $t_p = 25$ µs; | - | 40 | A |
| $I_{FSM}$ | non-repetitive peak forward current | t = 10 ms; sinusoidal waveform | - | 250 | A |
| | | t = 8.3 ms; sinusoidal waveform | - | 274 | A |
| $T_{stg}$ | storage temperature | | –40 | +150 | °C |
| $T_j$ | junction temperature | | - | 150 | °C |


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## 5. Thermal characteristics

**Table 4. Thermal characteristics**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | with heatsink compound; see Figure 1 | - | - | 1.2 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | - | 60 | - | K/W |

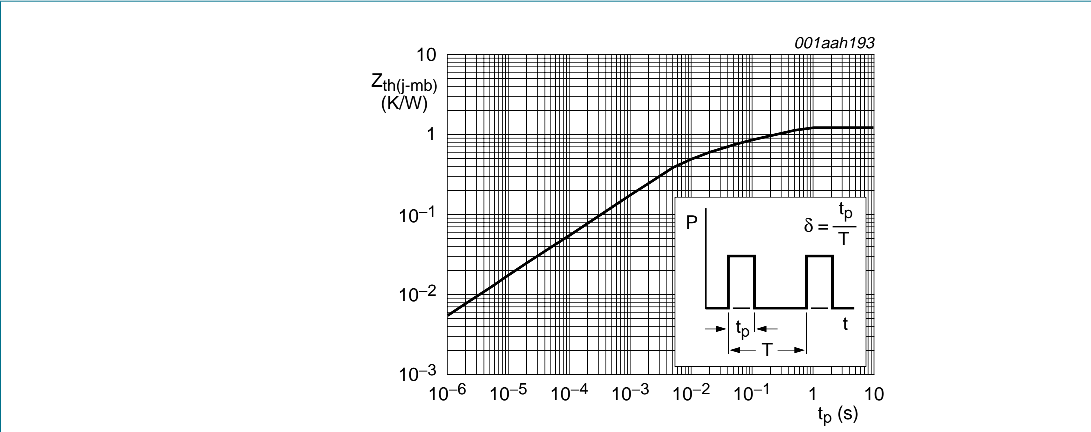


**Fig 1. Transient thermal impedance from junction to mounting base as a function of pulse width**



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## 6. Characteristics

**Table 5. Characteristics**
*$T_j$ = 25 °C unless otherwise specified.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static characteristics** | | | | | | |
| $V_F$ | forward voltage | $I_F$ = 20 A; $T_j$ = 150 °C; see Figure 2 | - | 1.54 | 1.97 | V |
| | | $I_F$ = 40 A; $T_j$ = 150 °C; see Figure 2 | - | 1.95 | 2.34 | V |
| | | $I_F$ = 20 A; see Figure 2 | - | 1.89 | 2.9 | V |
| $I_R$ | reverse current | $V_R$ = 600 V | - | 16 | 200 | µA |
| | | $V_R$ = 500 V; $T_j$ = 100 °C | - | 1.6 | 3.0 | mA |
| **Dynamic characteristics** | | | | | | |
| $t_{rr}$ | reverse recovery time | $I_F$ = 1 A to $V_R$ = 30 V; $dI_F/dt$ = 50 A/µs; see Figure 3 | - | 35 | 55 | ns |
| | | $I_F$ = 20 A to $V_R$ = 400 V; $dI_F/dt$ = 500 A/µs; see Figure 3 | | | | |
| | | $T_j$ = 25 °C | - | 19 | - | ns |
| | | $T_j$ = 100 °C | - | 32 | 40 | ns |
| $I_{RM}$ | peak reverse recovery current | $I_F$ = 20 A to $V_R$ = 400 V; $T_j$ = 125 °C; see Figure 3 | | | | |
| | | $dI_F/dt$ = 50 A/µs | - | 3.0 | 7.5 | A |
| | | $dI_F/dt$ = 500 A/µs | - | 9.5 | 12 | A |
| $V_{FR}$ | forward recovery voltage | $I_F$ = 20 A; $dI_F/dt$ = 100 A/µs; see Figure 4 | - | 8 | 11 | V |


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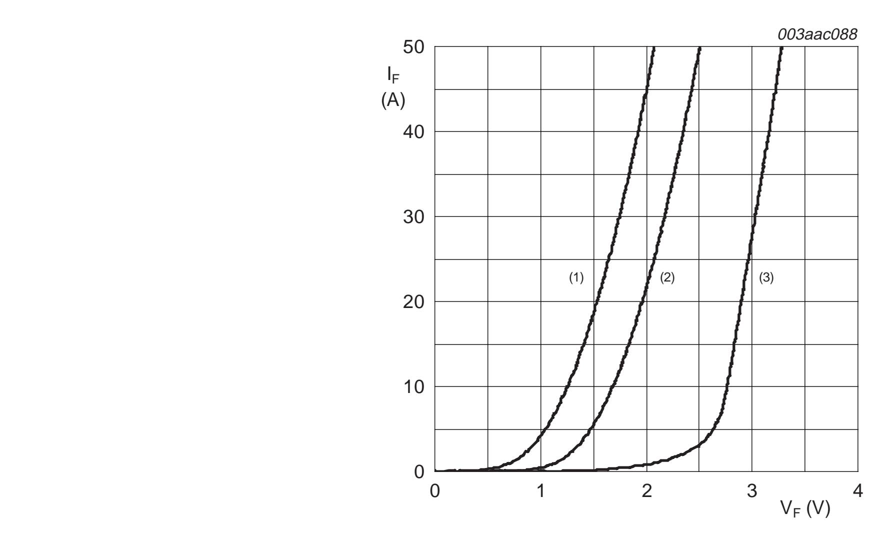


(1) $T_j$ = 150 °C; typical values

(2) $T_j$ = 150 °C; maximum values

(3) $T_j$ = 25 °C; maximum values

**Fig 2. Forward current as a function of forward voltage**

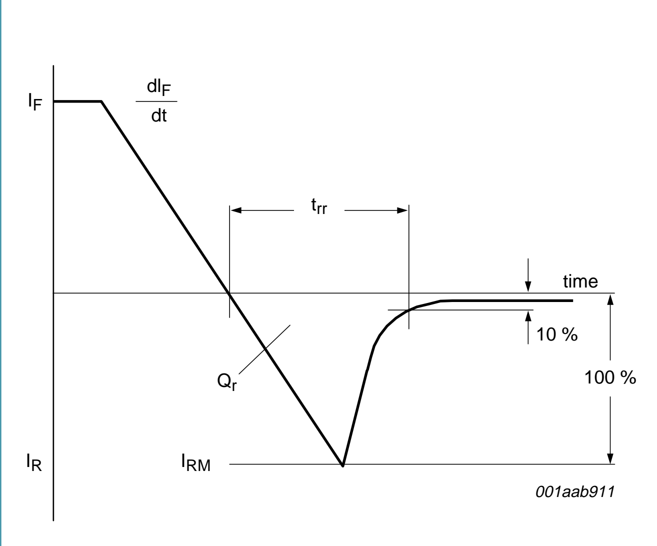


**Fig 3. Reverse recovery definitions**

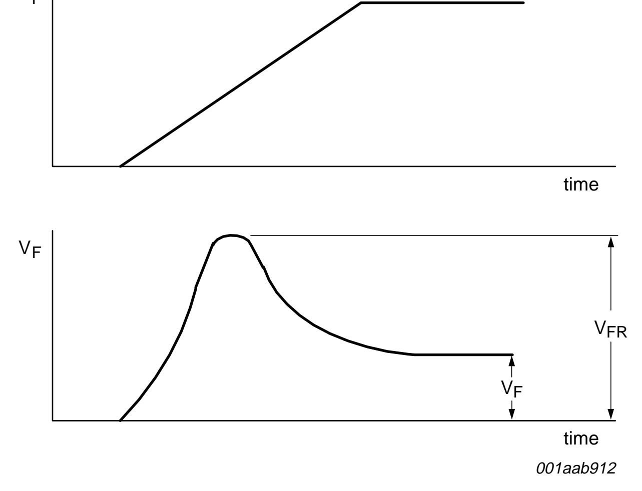


**Fig 4. Forward recovery definitions**


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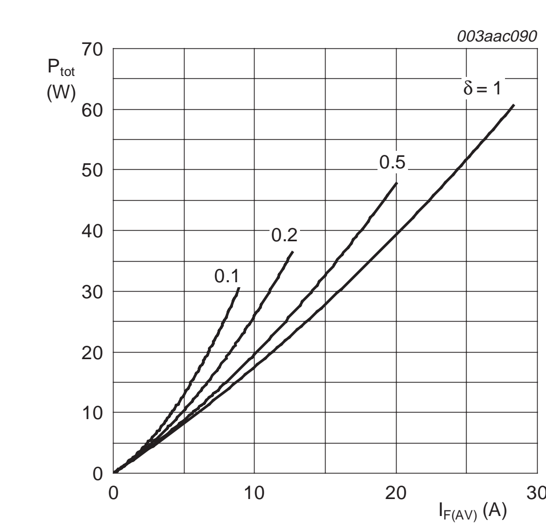
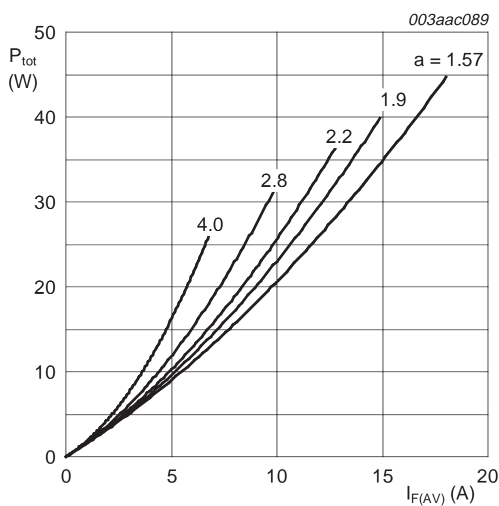



$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$

**Fig 5. Forward power dissipation as a function of average forward current; square waveform; maximum values**




a = form factor = $I_{F(RMS)} / I_{F(AV)}$

**Fig 6. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values**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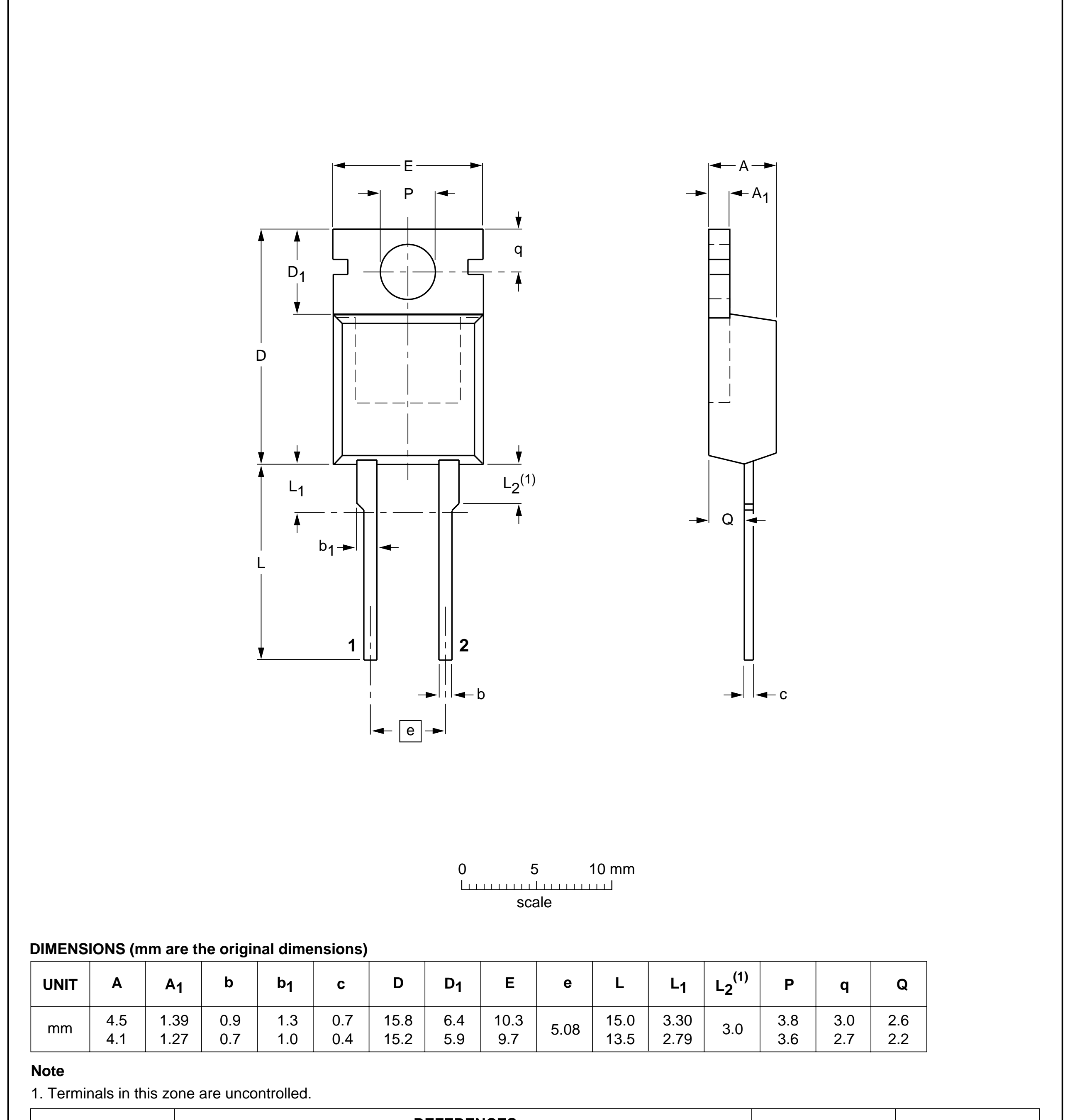
## 7. Package outline

**Plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC** **SOD59**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A | $A_1$ | b | $b_1$ | c | D | $D_1$ | E | e | L | $L_1$ | $L_2$(1) | P | q | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 4.5<br>4.1 | 1.39<br>1.27 | 0.9<br>0.7 | 1.3<br>1.0 | 0.7<br>0.4 | 15.8<br>15.2 | 6.4<br>5.9 | 10.3<br>9.7 | 5.08 | 15.0<br>13.5 | 3.30<br>2.79 | 3.0 | 3.8<br>3.6 | 3.0<br>2.7 | 2.6<br>2.2 |

**Note**

1. Terminals in this zone are uncontrolled.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOD59 | | 2-lead TO-220AC | | | | ~~99-09-13~~<br>05-10-25 |

Fig 7. Package outline SOD59 (2-lead TO-220AC)



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## 8. Revision history

**Table 6. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BYC20-600_1 | 20071128 | Product data sheet | - | - |


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| Document status[1][2] | Product status[3] | Definition |
|---|---|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
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[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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